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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/890,860	10/16/2001	Keith Herbert Dodd	899-26	7954

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Nixon & Vanderhye
8th Floor
1100 North Glebe Road
Arlington, VA 22201-4714

EXAMINER	
AUGHENBAUGH, WALTER	
ART UNIT	**PAPER NUMBER**
1772	

DATE MAILED: 07/01/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/890,860	DODD ET AL.	
	Examiner	Art Unit	
	Walter B. Aughenbaugh	1772	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *18 May 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *53-61 and 64-67* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *53-61 and 64-67* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on May 18, 2005 has been entered.

Acknowledgement of Applicant's Amendments

2. The amendments made in claims 53, 55, 58 and 59 in the Amendment filed May 18, 2005 (Amdt. E) have been received and considered by Examiner.

3. New claims 66 and 67 presented in Amdt. E have been received and considered by Examiner.

WITHDRAWN OBJECTIONS

4. The objection of claims 57 and 61 made of record in paragraph 7 of the previous Office Action mailed November 22, 2004 has been withdrawn due to Examiner's reconsideration in view of the Baurmeister patent which is relied upon in the new 35 U.S.C. 103(a) rejection of claims 53-61 as being unpatentable over Swozil et al. in view of Baurmeister made of record in this Office Action.

WITHDRAWN REJECTIONS

5. The 35 U.S.C. 112 rejection of claims 55 and 59 that was repeated in paragraph 5 of the previous Office Action mailed November 22, 2004 has been withdrawn due to Applicant's amendment in the last line of claims 55 and 59 in Amdt. E.

6. The 35 U.S.C. 103 rejection of claims 53-56 and 58-60 that was repeated in paragraph 6 of the previous Office Action mailed November 22, 2004 has been withdrawn due to Applicant's amendment in the second-to-last line of claims 53 and 58 in Amdt. E.

7. The 35 U.S.C. 103 rejection of claims 64 and 65 made of record in paragraph 8 of the previous Office Action mailed November 22, 2004 has been withdrawn due to Applicant's amendment in the second-to-last line of claims 53 and 58 in Amdt. E.

NEW REJECTIONS

Claim Rejections - 35 USC § 112

8. Claim 56 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 56 recites "a second layer" in the fifth line of the claim: it is unclear whether or not the "second layer" recited in the fifth line of the claim is intended to be the same as the "second layer" recited in the second to third line of the claim.

Claim Rejections - 35 USC § 103

9. Claims 53-61 are rejected under 35 U.S.C. 103(a) as being unpatentable over Swozil et al. in view of Baurmeister.

In regard to claims 53, 54 and 58, Swozil et al. teach an elongate tubular heat transfer element (a tube for a shell and tube heat exchanger, col. 1, lines 37-39) comprising a wall (the fiber layer taught by Swozil et al. that comprises fibers coated with a fluorine-containing polymer, col. 1, lines 37-45 and 57-65 and col. 1, line 66-col. 2, line 15) having an outer surface and an inner surface which determines a boundary of a hollow interior which extends longitudinally along the axis of the tube (the inner surface of the fiber layer of Swozil et al.

determines a boundary of a hollow interior that extends longitudinally along the axis of the tube because the fiber layer of Swozil et al. is bonded to the tube of Swozil et al.). The wall of Swozil et al. is of monolithic construction (since it is "cast as a single piece", see attached Merriam-Webster Online Dictionary definition 2a of "monolithic") and necessarily has an inner surface and an outer surface. Swozil et al. teach that glass fibers are a suitable corrosion resistant fiber and that corrosion resistant fibers are necessary (col. 3, lines 1-9). Swozil et al. teach polyvinylidene fluoride as a suitable fluorine containing polymer (col. 1, lines 6-21 and col. 3, lines 4-12). Swozil et al. therefore teach that the wall is formed from a composite material consisting essentially of a matrix of polyvinylidene fluoride having rovings of boron-free chemically resistant glass fibers embedded in the matrix (Swozil et al. does not require that the glass fibers comprise boron, and therefore, boron-free chemically resistant glass fibers fall within the scope of the glass fibers taught by Swozil et al.). Swozil et al. teach that the fibers are oriented cross-wise at an angle of approximately 60° on the tube body (col. 1, line 66-col. 2, line 4 and col. 4, lines 19-23 and 44-48).

Swozil et al. fail to explicitly teach that the rovings comprise from about 20% to about 60% by volume based upon the volume of the composite material and that the rovings include rovings which extend longitudinally in a lengthwise direction parallel to the tube axis of the tubular heat transfer element and rovings which extend spirally around the tube axis.

Baurmeister, however, disclose a heat exchange tube (col. 9, lines 7-14, col. 14, lines 15-19, col. 3, lines 50-56, col. 4, lines 66-67, col. 5, lines 29-34 and 42-49, col. 8, lines 43-45 and Fig. 1 and 5) comprising fibers oriented in a direction parallel to the tube axis and fibers which extend spirally around the tube axis (Fig. 2 and 4). Baurmeister disclose that the arrangement of

fibers taught by Baurmeister assures improved convective heat transport and increased heat transfer (col. 2, lines 38-45). Therefore, one of ordinary skill in the art would have recognized to have arranged the fibers of Swozil et al. in the pattern taught by Baurmeister since a web comprising fibers oriented in a direction parallel to the tube axis and fibers which extend spirally around the tube axis is well known to assure improved convective heat transport and increased heat transfer in heat exchange tubes as taught by Baurmeister.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have arranged the fibers of Swozil et al. in the pattern taught by Baurmeister since a web comprising fibers oriented in a direction parallel to the tube axis and fibers which extend spirally around the tube axis is well known to assure improved convective heat transport and increased heat transfer in heat exchange tubes as taught by Baurmeister.

Furthermore, Swozil et al. teach that the fibers within the matrix reinforce the heat transfer element (col. 2, lines 12-18). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have determined the optimum volume of glass fiber in terms of percentage of the volume of the composite material to use in the heat exchange element taught by Swozil et al. and Baurmeister that would yield the desired degree of reinforcement of the element depending on the desired end user result, in the absence of unexpected results.

In regard to claims 55 and 59, Swozil et al. fail to explicitly teach that the tube further comprises a first layer adjacent the outer surface of the wall, a second layer surrounding the first layer and at least one other layer intermediate the first and second layers wherein the first, second and the at least one other intermediate layers each include rovings wherein the rovings of

a particular layer all extend substantially in a common direction which is different from the common direction of any adjacent layer, wherein the common direction is in each case selected from a direction extending spirally around the tube axis and a direction extending longitudinally in a lengthwise direction parallel to the tube axis. Baurmeister, however, disclose that the tube has three or more layers of fibers wherein the direction of the fibers in a particular layer alternates between a direction extending spirally around the tube axis (helically as taught by Baurmeister, see col. 4, lines 4-13) and a direction extending longitudinally in a lengthwise direction parallel to the tube axis (rectilinearly as taught by Baurmeister, see col. 4, line 56) (col. 4, lines 53-63). Therefore, one of ordinary skill in the art would have recognized to have added at least three additional layers of fibers to the tube taught by Swozil et al. and Baurmeister wherein the direction of the fibers in a particular layer alternates between a direction extending spirally around the tube axis and a direction extending longitudinally in a lengthwise direction parallel to the tube axis as taught by Baurmeister since a tube of at least four layers (the wall as claimed by Applicant and at least three additional layers, which is taught in the embodiment of Baurmeister at col. 4, lines 57-59 where there are four layers) where the orientation of the fibers of each layer alternates from layer to layer is a well known structure for heat exchange tubes as taught by Baurmeister.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have added at least three additional layers of fibers to the tube taught by Swozil et al. and Baurmeister wherein the direction of the fibers in a particular layer alternates between a direction extending spirally around the tube axis and a direction extending longitudinally in a lengthwise direction parallel to the tube axis as taught by Baurmeister since a tube of at least four

layers (the wall as claimed by Applicant and at least three additional layers, which is taught in the embodiment of Baurmeister at col. 4, lines 57-59 where there are four layers) where the orientation of the fibers of each layer alternates from layer to layer is a well known structure for heat exchange tubes as taught by Baurmeister.

In regard to claims 56 and 60, Swozil et al. fail to explicitly teach that the wall comprises the three layers as claimed in claims 56 and 60. Baurmeister, however, disclose that the tube comprises three layers of fibers wherein the direction of the fibers in a particular layer alternates between a direction extending spirally around the tube axis (helically as taught by Baurmeister, see col. 4, lines 4-13) and a direction extending longitudinally in a lengthwise direction relative to the tube axis (rectilinearly as taught by Baurmeister, see col. 4, line 56) (col. 4, lines 53-63). Therefore, one of ordinary skill in the art would have recognized to have formed the wall of the tube of Swozil et al. such that it comprises three layers where the fibers of the intermediate layer extend longitudinally in a lengthwise direction relative to the tube axis and the fibers of the inner and outer layers extend spirally around the tube axis as taught by Baurmeister since a tube comprising three layers where the fibers of the intermediate layer extend longitudinally in a lengthwise direction relative to the tube axis and the fibers of the inner and outer layers extend spirally around the tube axis is a well known structure for heat exchange tubes as taught by Baurmeister.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have formed the wall of the tube of Swozil et al. such that it comprises three layers where the fibers of the intermediate layer extend longitudinally in a lengthwise direction relative to the tube axis and the fibers of the inner and outer layers extend spirally around the tube axis as

taught by Baurmeister since a tube comprising three layers where the fibers of the intermediate layer extend longitudinally in a lengthwise direction relative to the tube axis and the fibers of the inner and outer layers extend spirally around the tube axis is a well known structure for heat exchange tubes as taught by Baurmeister.

In regard to claims 57 and 61, Swozil et al. fail to explicitly teach that the rovings in the intermediate layer comprise about 60% of the total rovings and that the rovings of the first and second layers together comprise about 40% of the total of all rovings in the heat transfer element. Baurmeister, however, disclose that the wall thicknesses of the various fibers (therefore, of the various layers) can be different from each other (col. 5, lines 26-28). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have varied the relative thicknesses of the different layers of the tube taught by Swozil et al. and Baurmeister in order to achieve the desired properties of the tube, such as flexibility in either of the transverse or longitudinal directions, depending on the desired end result, in the absence of unexpected results.

10. Claims 64-67 are rejected under 35 U.S.C. 103(a) as being unpatentable over Swozil et al. in view of Baurmeister and in further view of O'Connor.

Swozil et al. and Baurmeister teach the heat transfer element as discussed above. Swozil et al. and Baurmeister fail to teach that the composite material further comprises a particulate metal. O'Connor, however, discloses that suitable materials for the reinforcement of thermoplastic materials are glass fibers and metal fibers such as iron fibers or a mixture of glass fibers and metal fibers (col. 3, lines 25-31). In further regard to claims 66 and 67, metal is, by definition, thermally conductive. Therefore, one of ordinary skill in the art would have

recognized to have used metal fibers such as iron fibers in combination with the glass fibers of Swozil et al. as a reinforcing agent, since it is well known to use a combination of glass and metal fibers as reinforcing agents of thermoplastic material as taught by O'Connor.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used metal fibers such as iron fibers in combination with the glass fibers of Swozil et al. as a reinforcing agent, since it is well known to use a combination of glass and metal fibers as reinforcing agents of thermoplastic material as taught by O'Connor.

Response to Arguments

11. Applicant's arguments regarding the 35 U.S.C. 112 rejection of claims 55 and 59 presented on pages 6 and 7 of Amdt. E are moot due to the withdrawal of this rejection in this Office Action.

12. Applicant's arguments regarding the applicability of Swozil et al. presented on pages 7 and 8 of Amdt. E have been fully considered but are not persuasive.

Applicant's arguments in the last two paragraphs of page 7 of Amdt. E regarding the recitation "defining a hollow interior" are moot since Applicant has replaced the recitation "defining a hollow interior" with --which determines a boundary of a hollow interior-- in Amdt. E. Regardless, since the fibrous layer of Swozil et al. covers the tube of Swozil et al. as Applicant points out, the fibrous layer of Swozil et al. does "delineate the outline or form of" the hollow interior of the tube since it covers the tube and therefore contributes to delineate the outline and form of the hollow interior of the tube along with the tube. The inner surface of the fiber layer of Swozil et al. determines a boundary of a hollow interior that extends longitudinally

along the axis of the tube because the fiber layer of Swozil et al. is bonded to the tube of Swozil et al.).

Applicant argues on page 8 of Amdt. E that the coating of fluorine-containing polymer of Swozil is not a matrix, but since Swozil teaches a layer that comprises the fluorine-containing polymer and the fibers, and that the coating of fluorine-containing polymer "covers each tube wall completely" (col. 2, lines 18-19, 33-35 and 59-65), the coating of fluorine-containing polymer is a matrix in which the fibers are embedded.

13. Applicant's arguments regarding the applicability of O'Connor presented on page 8 of Amdt. E have been fully considered but are not persuasive. Applicant argues that the combination of O'Connor with Swozil is inappropriate because Applicant's purpose for the particulate metal is different than the purpose of the particulate metal as taught by Swozil, but the fact that Applicant uses the particulate metal for a different purpose does not alter the conclusion that its use in a prior art device would be *prima facie* obviousness from the purpose disclosed in the O'Connor reference.

Conclusion

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Walter B. Aughenbaugh whose telephone number is 571-272-1488. The examiner can normally be reached on Monday-Thursday from 9:00am to 6:00pm and on alternate Fridays from 9:00am to 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Harold Pyon, can be reached on 571-272-1498. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Walter B. Aughenbaugh
06/24/05 WBA

HAROLD PYON
SUPERVISORY PATENT EXAMINER
1772

6/27/05